

What is claimed is:

1. A non-aqueous electrolyte for use in rechargeable Li-ion batteries comprising a solution of a lithium salt in a non-aqueous organic solvent containing a Lewis base additive.
2. A non-aqueous electrolyte according to claim 1 wherein said Lewis base additive is selected from the group consisting of amines, phosphines and nitrogen-phosphorus bonded compounds as well as mixtures thereof.
3. A non-aqueous electrolyte according to claim 2 wherein said Lewis base additive is an amine selected from the group consisting of triethylenediamine (TEDA) and 2,2'-bipyridine (BIPY) as well as mixtures thereof.
4. A non-aqueous electrolyte according to claim 2 wherein said Lewis base additive is a phosphine selected from the group consisting of triphenylphosphine (TPP) and tributylphosphine (TBP) as well as mixtures thereof.
5. A non-aqueous electrolyte according to claim 2 wherein said Lewis base additive is a nitrogen-phosphorus bonded compound selected from the group consisting of hexamethoxycyclotriphosphazene ($[N=P(OCH_3)_2]_3$) (HMOPA), hexamethylphosphoramide (HMPA) and *N*-phenyl-*P,P,P*-trimethylphosphorimidate (PhTMI) as well as mixtures thereof.
6. A non-aqueous electrolyte according to claim 2 wherein said lithium salt is selected from the group consisting of lithium hexafluorophosphate ($LiPF_6$), lithium hexafluoroarsenate($LiAsF_6$) and lithium tetrafluoroborate ($LiBF_4$) as well as mixtures thereof.
7. A non-aqueous electrolyte according to claim 6 wherein said lithium salt is lithium hexafluorophosphate ($LiPF_6$).
8. A non-aqueous electrolyte according to claim 2 wherein said organic solvent is selected from the group consisting of organic carbonates, esters, ethers, glymes, organic nitriles, and sulfones as well as mixtures thereof.
9. A non-aqueous electrolyte according to claim 8 wherein said organic solvent is a cyclic organic carbonate selected from the group consisting of ethylene carbonate (EC), propylene carbonate (PC), triethylene carbonate (TEC), and isobutylene carbonate (IBC) as well as mixtures thereof.
10. A non-aqueous electrolyte according to claim 9 wherein said organic solvent is ethylene carbonate.

11. A non-aqueous electrolyte according to claim 8 wherein said organic solvent is an acyclic organic carbonate selected from the group consisting of dimethyl carbonate (DMC), diethyl carbonate (DEC) and ethylmethyl carbonate (EMC) as well as mixtures thereof.
12. A non-aqueous electrolyte according to claim 8 wherein said organic solvent is a compound of the general formula ROCOOR' , where R and R' are the same or different alkyl groups.
13. A non-aqueous electrolyte according to claim 8 wherein said organic solvent is a mixture of the cyclic organic carbonate ethylene carbonate (EC) and one or more acyclic organic carbonates selected from the group consisting of dimethyl carbonate (DMC), diethyl carbonate (DEC), ethylmethyl carbonate (EMC), as well as compounds of the general formula ROCOOR' , where R and R' are the same or different alkyl groups, and mixtures thereof.
14. A non-aqueous electrolyte of claim 4 wherein the said non-aqueous solvent is a mixture of the cyclic organic carbonates selected from the group consisting of ethylene carbonate (EC), propylene carbonate (PC), triethylene carbonate (TEC) and isobutylene carbonate (IBC) and one or more acyclic carbonates selected from the group consisting of dimethyl carbonate (DMC), diethyl carbonate (DEC), ethylmethyl carbonate (EMC), as well as compounds of the general formula ROCOOR' , where R and R' are the same or different alkyl groups and mixtures thereof.
15. An electric current producing rechargeable Li-ion cell comprising an anode; a cathode; and a non-aqueous electrolyte comprising a solution of a lithium salt in a non-aqueous organic solvent containing a Lewis base additive.
16. An electric current producing Li-ion cell according to claim 15 wherein said Lewis base additive is selected from the group consisting of amines, phosphines, nitrogen-phosphorus bonded compounds and mixtures thereof.
17. An electric current producing Li-ion cell according to claim 16 wherein said Lewis base additive is an amine selected from the group consisting of triethylenediamine (TEDA) and 2,2'-bipyridine (BIPY) and mixtures thereof.
18. An electric current producing Li-ion cell according to claim 16 wherein said Lewis base additive is a phosphine selected from the group consisting of triphenylphosphine (TPP) and tributylphosphine (TBP) and mixtures thereof.
19. An electric current producing Li-ion cell according to claim 16 wherein said Lewis base additive is a nitrogen-phosphorus bonded compound selected from the group consisting of hexamethoxycyclotriphosphazene ($[\text{N}=\text{P}(\text{OCH}_3)_2]_3$) (HMOPA), hexamethylphosphoramide (HMPA), *N*-phenyl-*P,P,P*-trimethylphosphorimidate (PhTMI) and mixtures thereof.

20. An electric current producing Li-ion cell according to claim 16 wherein the said anode consists of a lithium intercalating compound.
21. An electric current producing Li-ion cell according to claim 20 wherein the said lithium intercalating compound is a carbonaceous material
22. An electric current producing Li-ion cell according to claim 16 wherein the said cathode is a lithium intercalating transition metal compound.
23. An electric current producing Li-ion cell according to claim 22 wherein said lithium intercalating transition metal compound is selected from the group consisting of LiCoO_2 ; LiNiO_2 ; $\text{LiNi}_{1-x}\text{Co}_x\text{O}_2$ where x is $0.3 < x < 1.0$; LiMn_2O_4 ; LiV_2O_5 ; $\text{LiM}_x\text{N}_{1-x}\text{O}_2$, where M and N are transition metals and x has a value between zero and one; LiFePO_4 ; LiCrS_2 ; and LiVS_2 .
24. An electric current producing Li-ion cell according to claim 16 wherein said lithium salt is selected from the group consisting of lithium hexafluorophosphate (LiPF_6), lithium hexafluoroarsenate(LiAsF_6) and lithium tetrafluoroborate (LiBF_4) as well as mixtures thereof.
25. An electric current producing cell Li-ion according to claim 16 wherein said organic solvent is selected from the group consisting of organic carbonates, esters, ethers, glymes, organic nitriles and sulfones as well as mixtures thereof.